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EMBRYOLOGY.[1]

Fertilization.—Our present conceptions of the meaning and of the cell factors concerned in the act of fertilization have been based so largely upon the views of Boveri and these arose so directly from the study of the eggs of *Ascaris megalocephala* that it is of the greatest importance to know how far we rest assured in the knowledge of the truth in this classical object.

The well-known editor of LA CELLULE has with M. H.. Labrun restudied fertilization in this worm and obtained facts quite at variance with those commonly accepted. Professor Carnoy studies sections that are obtained after killing the eggs with a mixture of absolute alcohol, chloroform and acetic acid saturated with corrosive sublimate and this certainly yields most beautiful pictures of reticular appearances throughout cell and nucleus.

While Boveri regarded the introduction of a centrosome by the sperm as a most important part of fertilization Carnoy denies that there is any such fact. For Boveri, the sexes are not alike since the egg has no centrosome to start the process of fertilization and the sperm has such a centre. For Carnoy, there is entire equality of the sexes since both sperm and egg each furnish a centrosome for the first cleavage and in every other way the fertilized egg is a combination of the same elements from both sexes.

A cardinal point in Carnoy's observations is the fact, as claimed, that the nucleoli pass out from the nuclei and become the centrosomes! The centrosomes also vanish after each cleavage and *do not divide* to make new ones!

A summarization of his facts includes the following assertions: 1. At the last division of the series of cells that form eggs, the centrosome vanishes from the protoplasm and new ones are formed in the nucleus of the unripe egg. 2. In the formation of the polar bodies these centrosomes emerge from the nucleus and function ; perhaps they disappear after the first, and are formed again for the second, polar body. 3. Both polar bodies are formed with the presence of centrosome and asters ; but these structures then disappear and there is no centre left in the protoplasm of the ripe egg. 4. The sperm introduces a large mass of reticulum and this acts upon the reticulum of the egg to produce a radiating change that gradually works over and modifies the entire egg. Boveri's *archoplasm* does not exist except as this radiating area of influence. 5. In this radiating mass there is no centrosome, no sperm centre—nothing but a mass of nucleo-albuminiferous enchylema discharged from the sperm and in process of solution. 6. Up to the time of cleavage there are no centrosomes in the protoplasm and there can be no "quadrille of the centres." 7. The centrosomes arise early in the pronuclei, one in each, as nucleoli. 8. One centrosome comes out of the sperm nucleus and one out of the egg and they function as soon as they get into the eggs protoplasm, to form asters. 9. The spindle is made from the network of the nucleus, (fused sperm and egg nuclei), under the influence of the centrosomes. 10. The centrosomes do not divide but dissolve; the asters also disappear without dividing. 11. In each new nucleus two new nucleoli arise and after a dormant period pass out to function as centrosomes in the next cleavage.

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[1] Edited by E. A. Andrews, Baltimore, Md., to whom abstracts, reviews and preliminary notes may be sent.

Fertilization is thus a most complex process in which two individuals of different origin merge into one new entity of mixed nature; mixed not only in chromosomes but in all parts; cytoplasm, caryoplasm, centrosomes, all of double origin, male and female.

The egg may transmit the properties of both parents since it acts as a mixed being of double origin in all parts, throughout cleavage and subsequently. The entire egg not only the nucleus but also the outer protoplasm may be concerned in heredity.

As life remains a complex of mysterious and unexplained phenomena the author deems it folly to venture hypotheses as to the nature of heredity. "Sachons avouer notre ignorance profonde et nous arrêter à la limite de notre modeste savoir."

PSYCHOLOGY.[1]

The Physical Basis of Pain.—The unsettled state of opinion among psychologists in regard to the nature of pain was touched upon last year in these notes.[2] The chief points at issue are whether pain and pleasure should be classed as sensations or as affective elements of consciousness, and how far a distinction should be drawn between so-called physical pain (Schmerz) and pain in the sense of displeasure (Unlust). The older theories in general regarded pain solely as a feel-

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[1] Edited by Howard C. Warren, Princeton University, Princton, N. J.

[2] November, 1896, p. 948.